NOTES 15: MORE ON TESTING

Stat 120 | Fall 2025

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H_0	True	H_{\circ}	False
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Reject H_0

Do not reject H_0

Type I Error

Rejecting ${\cal H}_0$ when ${\cal H}_0$ is true

Type II Error

Failing to reject ${\cal H}_0$ when ${\cal H}_0$ is false

α (Significance Level)

The probability of making a Type I error is α (which we get to decide.)

β

The probability of making a Type II error

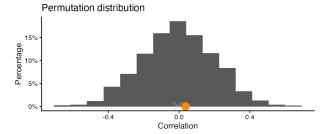
Power

The probability of rejecting H_0 when H_0 is false (High power = good, low power = bad). Equal to $1-\beta$

Example: A public health researcher believes that there is a positive relationship between heart rate and age among ICU patients. Data from 23 patients gives r=0.037. Do you think the probability of a Type II error is higher if $\rho=.9$ or $\rho=.1$?

 $H_0: \rho = 0$

 $H_A: \rho>0$



Big Picture Picture

Sampling Distribution

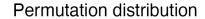
Bootstrap Distribution

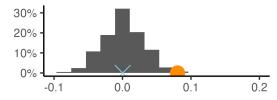
Null Distribution

Connection to Confidence Intervals

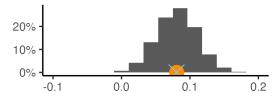
If the value of H_0 is *outside* of the confidence interval, we ______. If the value of H_0 is *inside* the confidence interval, we ______.

Illustration: (Social Media Poll Example)





Bootstrap distribution



1 Statistical vs Practical Significance

Example: Breaking news! I have a proven way to improve your exam scores! The difference in Exam 02 scores between students who do this and students who don't is statistically significant! All you have to do is come to every office hour, read each chapter of the textbook 5 times, and do every single problem in the book.

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Sample Statistic:

Statistical vs Practical Significance

When making conclusions, it's important to consider **effect size** alongside statistical significance